

## DOCUMENTATION REQUIREMENTS

### Irrigation Canal or Lateral - 320

#### I. Reference Materials

- a. Engineering Field Manual – Chapters Three (Hydraulics), Six (Structures), and Fifteen (Irrigation)
- b. ND Supplement to Engineering Field Manual – Chapter Fifteen (Irrigation)
- c. SCS-TR-25 - Design of Open Channels
- d. Section IV Technical Guide, Practice Standard 320, Irrigation Canal or Lateral
- e. North Dakota Irrigation Guide
- f. National Irrigation Guide with ND Supplements
- g. Soil Survey Report
- h. North Dakota Construction and Material Specifications for Conservation Practices
- i. Suitable Computer Software:
  - Hydraulics (e.g. Ohio Program, Hec-Ras)
  - Watershed Hydrology (e.g. EFM2, EFH2, TR55)
  - Excel Spreadsheet Hydrology (e.g. ND-ENG-12e)
  - Excel Spreadsheet Yardage (e.g. ND-ENG-1e)

#### II. Site Investigation/Data Collection

The following is a list of items to be checked in the field:

- a. Does proposed canal or lateral have an adequate and stable inlet and outlet?
- b. Determine waterway drainage area, average watershed slope, and weighted cover complex number if uncontrolled source affects design or is to be diverted.
- c. Log soils in canal/lateral and review soil survey data. Is salinity a problem? Determine soil(s) hydraulic conductivity. Are losses significant to warrant lining?
- d. Determine irrigation water needs, efficiencies of existing versus proposed system components.
- e. Estimate existing and proposed future management practices.
- f. Check for buried utilities, North Dakota ONE-CALL.
- g. Determine engineering job class.

#### III. Design Surveys

- a. Survey notes shall be kept in loose-leaf or bound field notebooks. The notes will be kept in a format similar to that shown in Technical Release 62 and Chapter I, Engineering Field Manual. Electronic survey notes will be documented in a format that allows complete checking by others.
- b. The surveyor will use sound professional judgement in gathering information for the design and construction of the irrigation canal or lateral. Information will be used to determine waterway grades and estimated quantities.

#### IV. Design Plans and Specifications

The design of a practice will be in accordance with Standard 320-Irrigation Canal or Lateral, Section IV, Technical Guide.

The steps in design are as follows:

- a. Plot canal/lateral existing or proposed centerline profile, field elevations, soils logs, and cross sections on appropriately sized sheets, either hand drafted or CADD developed.
- b. Determine available water supply, using historical delivery and/or water rights. Dependability of source, restricted or on-demand, should be determined. Increased efficiency will either allow water saved or more land to be irrigated. Each practice location will be different and require different actions.
- c. High permeability soils will likely require lining. Lining options are varied and should be fully analyzed and discussed with the landowner. In some cases it will be more economical and labor saving to convert the system to buried pipeline (Standard 430). The high expense requires careful consideration.
- d. Determine allowable canal/lateral velocities based on TR-25 Design of Open Channels, Standard 320 – Irrigation Canal or Lateral, Section IV, Technical Guide or other acceptable criteria based on lining material (e.g. Dept. of Transportation HYDRAIN – Hychl Program).
- e. Determine the required dimensions by using appropriate tables and programs previously described.
- f. Determine earth work and seeding quantities. The volume of work in cubic yards will be determined by the method of average cross sectional end area. Computations will be shown, or computer printout of all input and output.

#### V. Material and Construction Requirements

The cooperator, contractor, and the NRCS cooperator's file will be provided a set of plans and specifications for the construction. Plans can be shown on appropriately sized grid or plan/profile sheets.

The plans will contain, as a minimum, the following:

- a. Overall Plan View. This may be superimposed on the location map. Show stationing and identify reaches.
- b. Profile - Centerline of canal or lateral. Show original ground superimposed on design grade, stationing, reaches, etc. Centerline profiles are required.
- c. Cross Sections - Show typical cross sections for each reach. Cross sections are required at all significant changes in original cross section shapes and grades to calculate quantities.
- d. Construction Notes - Add notes to clarify or furnish direction for construction.

- e. Quantities - Estimates based on cross sections and structural design computations.
- f. Job Approval.

Construction specifications are to be provided with each set of plans. The North Dakota Construction and Material Specification for Conservation Practices shall be used for each item of work and material, as applicable or available. Additional specifications may need to be written to provide full material and installation instructions. A cover sheet and list of specifications is to be provided with the specifications.

#### VI. Layout and Installation Procedures

Layout surveys will be recorded in loose-leaf or bound survey books. Set necessary stakes for at alignment, depth, width, and side slopes. Set grade stakes as needed. Survey notes will be kept in the format as shown in Chapter I - Engineering Field Manual and/or Technical Release 62. Electronic survey notes will be documented in a format to allow complete checking by others.

#### VII. Checkout

- a. Completed grade of canal or lateral will be taken.
- b. Sufficient cross sections will be taken to insure the design has been adhered to.
- c. All yardage computations will be checked as applicable.
- d. Measure lengths, areas seeded, quantities for linings, pipe, structures.
- e. Check size, dimensions, elevations, etc. on all structures.
- f. Record all data in field notes.
- g. Technician's signature and date checked.
  - (1) Statement of compliance on "as-built" plans - that construction is complete according to plans and specifications, and adequacy or status of vegetation and topsoil placement. Date and sign by individual making determination.
  - (2) Use Form ND-ENG-51e, Sprinkler Irrigation Basic Data, or equivalent form as a guide for including all pertinent information regarding soils, crops, water quantity-quality, water rights, and management.